

THE REDISCOVERY OF *HELEIOPORUS AUSTRALIACUS* (SHAW)  
(ANURA: LEPTODACTYLIDAE) IN EASTERN VICTORIA

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**Introduction**

In January, 1903, a specimen of *Heleioporus australiacus* (Shaw) (then known as *Philocryphus flavoguttatus*) from Tongio West, Vic., about 16 miles S. of Omeo, was exhibited by the National Museum of Victoria at the monthly meeting of the Field Naturalists Club of Victoria. This exhibition, and a comment on the uniqueness of the specimen by Mr J. A. Kershaw, were recorded in the published report of this meeting (Anon, 1903). It is presumably because of this indirect way of recording that the reference has been completely overlooked in the subsequent relevant literature, including the comprehensive bibliography on Australian Anura assembled by Moore (1961).

There is a single specimen of *H. australiacus* in the National Museum of Victoria (Catalogue No. 3293) from Tongio West, donated by J. Avcry on October 29, 1907. It would seem that this specimen is the same as the one exhibited in 1903, but that there was some delay or error in recording the date of acquisition. There can be no doubt as to the identity of the specimen since this is a most distinctive species, and the specimen is in good condition. Until the present note, this information constituted the entire knowledge of *H. australiacus* in Victoria.

Moore (1961) has summarized the available information on the species and pointed out its peculiar distribution with two widely disjunct populations, one in the Sydney area, N.S.W., and the other in the Darling Range in southwestern W.A. Main (1965) briefly described the general biology and range of the southwestern populations of *H. australiacus*.

In January, 1963, while surveying the anuran fauna of coastal N.S.W., we had the good fortune to obtain a single specimen of *H. australiacus* and a recording of its mating call at Jervis Bay, about 2 miles NW of the Naval College. Two others were heard in the area but were not collected. The one specimen subsequently escaped, but not before it had been adequately photographed.

On December 6, 1965, while engaged in further survey work, we obtained three more specimens of this species on the road from Bombala, N.S.W., to Cann River, Vic. The first of these was collected 25 miles S of Bombala (about 5 miles N of the Victorian border). The second and third specimens were collected in Victoria, 200 and 300 yards, respectively, south of the border (i.e. about 29 miles N of Cann River). These two individuals were breeding males, and tape recordings of their mating calls were made before they were collected. In addition, the calls of another three individuals were heard in the area, and one of these was recorded.

On February 23, 1966, one of us (A.A.M., assisted by Mr P. A. Rawlinson) collected two more male *H. australiacus* 2½ miles N of Boola Camp, i.e. about 7 miles S of Walhalla, Vic. On this occasion egg masses of this species were also found, and these will be reported on later.

The occurrence of *H. australiacus* in Victoria is thus established beyond doubt, and in fact the westward penetration of this species into Victoria is much greater than was previously supposed. Our records indicate that *H. australiacus* probably has a continuous range from the Sydney area, N.S.W., to the Walhalla area, Vic.

Main (1965) has indicated that Dr A. K. Lee, of the Department of Zoology and Comparative Physiology, Monash University, using morphological criteria, considers that the southeastern and southwestern populations of *H. australiacus* are specifically distinct, and will describe the latter as a new species in due course. Accordingly, an objective comparison of mating call structure of the southeastern and southwestern disjuncts has been made, as it may be of some assistance in assessing the degree of potential premating reproductive isolation.

Littlejohn and Main (1959) described the mating call of the southwestern population and figured an audiospectrogram of a call. An oscillogram of a call is given by Littlejohn (1965a). Since the mating call of the southeastern population has been described only in general and quite subjective terms (Harrison, 1922; Moore, 1961), an objective and relatively complete description is given herewith, together with observations on adult morphology, habitat, food, and calling behaviour.

#### Adult Morphology

Our specimens (one of which is shown in Pl. 8, fig. 1) agree closely in morphology with the description given by Moore (1961). The three animals collected on the Cann River road have body lengths of 80.4, 86.0, and 89.9 mm, and tibia

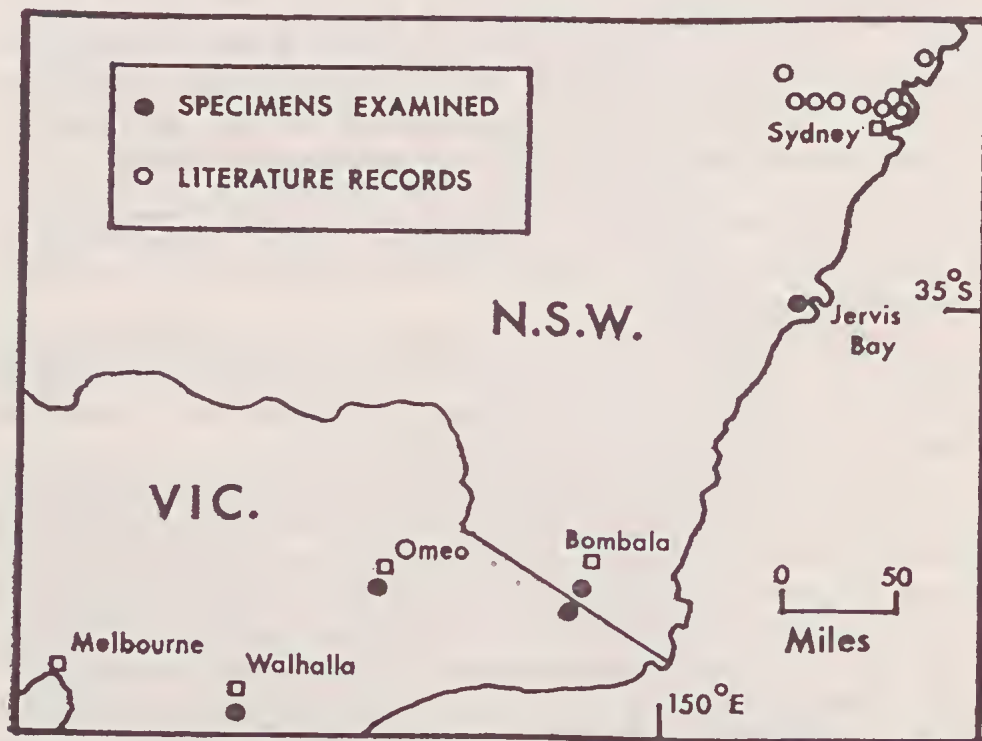


FIG. 1—The known distribution of *Heleioporus australiacus* in southeastern Australia. The literature records are from Moore (1961).

length/body length ratios of 0.37, 0.35 and 0.35, respectively. All three have the large, black nuptial spines on the first three fingers well developed (Pl. 8, fig. 1; and also see Moore, 1961, p. 180, Fig. 9). These spines, together with the animal's large size, spiny dorsal skin texture, bright yellow lateral warts, and pinkish ventral surface, make *H. australiacus* a most distinctive and unmistakable species.

### Habitat

The three Cann River road specimens were collected in an area of dense wet sclerophyll forest. The two calling males were found in a shallow creek lined by a stand of tree-ferns. The creek flows through a deep gully, with earth banks and a sandy bottom, and scattered rock outcrops. One male was calling from a large, partially-flooded burrow in the soft earth at the base of the bank. The other was in a more open position in the middle of a small pool, partly concealed by a mass of plant detritus.

The Jervis Bay specimen was also calling from a burrow in the bank of a rivulet, in an area of coastal heath with scattered eucalypts. Two more individuals, which we did not collect, were calling in a more heavily forested area.

### Food

Since the feeding habits of *H. australiacus* are apparently unrecorded, the following may be of interest. A faecal pellet of the specimen collected 25 miles S of Bombala contained remains of:

ARACHNIDA: small buthid scorpion, large araneomorph spider.

DICTYOPTERA: two cockroaches.

HEMIPTERA: reduvioid bug.

HYMENOPTERA: two large ants.

COLEOPTERA: numerous carabids, one scarabaeoid, one curculionid, and some unidentified material.

### Mating Call Structure

The mating call of the eastern disjunct of *H. australiacus* may be described as a short, soft, musical, pulsed note, regularly repeated in long sequences. Moore (1961) has given an adequate verbal description of the call: 'a soft, owl-like "ou-ou-ou".' Our tape recordings, obtained in the field, were analysed on a cathode ray oscilloscope and a sound spectrograph (Kay Sona-Graph Model 6061 A), giving the following physical characteristics, which are summarized in Table 1.

**TEMPORAL CHARACTERISTICS:** The call, which is repeated about 18-24 times per minute, has a duration of just over half a second. The envelope is overmodulated so that the call consists of 5-7 discrete pulses, each of 50-60 milliseconds duration, and separated by a slightly longer pulse interval (silent period between the end of one pulse and the beginning of the next) of about 70-80 milliseconds. The pulse repetition rate ranges from 7.6 to 10.7 pulses per second, and the rise and fall in amplitude of each pulse is gradual.

**SPECTRAL CHARACTERISTICS:** Most of the energy is contained within a low fundamental frequency (320-390 cycles/second) which is thus also the dominant frequency of the call. Two to four additional harmonics of reduced energy content are also present. No pronounced frequency modulation is evident.

An oscillogram and an audiospectrogram of a call are shown in Pl. 8, fig. 2.



TABLE 1

Physical characteristics of mating calls of *Heleioporus australiacus*. Data for each individual are based on the analysis of 3 calls, and only mean values are given since there is very little variation in the successive calls of an individual.

| Individual No.                                   | 29 miles N. of Cann River,<br>Vic. |      |      | Jervis Bay,<br>N.S.W. |
|--|------------------------------------|------|------|-----------------------|
|  | 1                                  | 2    | 3    | 1                     |
| Water temperature, °C                            | 14.4                               | 15.0 | 15.6 | 18.5                  |
| Wet bulb air temperature, °C                     | 15.0                               | —    | 14.3 | 16.0                  |
| Call duration (seconds)                          | 0.58                               | 0.59 | 0.53 | 0.53                  |
| Pulses per call                                  | 5                                  | 7    | 5    | 6                     |
| Pulse repetition rate* (pulses/second)           | 7.6                                | 10.7 | 8.3  | 10.6                  |
| Call repetition rate (calls/minute)              | 18.3                               | 20.5 | 21.5 | 23.5                  |
| Fundamental (dominant) frequency (cycles/second) | 340                                | 320  | 360  | 390                   |

\* Determined from the formula:  
No. of pulses—1

Total call duration—duration of first pulse

#### Comparison with the Mating Call of the Southwestern Disjunct

Littlejohn and Main (1959) listed an approximate fundamental frequency of 200 cycles/sec. for the mating call of one individual from Greenmount, W.A. A recalculation from an oscillogram of a call in the same recording sequence gave a value close to 340 cycles/sec. The lower reading in the earlier reference was obtained from a sound spectrograph tracing and the difference may be due to the width of the baseline in such tracings (which has a considerable influence on the assessment of correct values of these very low audio frequencies).

The call of the western individual (which is fairly representative of the disjunct) differs slightly from those of the eastern disjunct in having a shorter call duration and in being more rapidly repeated. It differs markedly in that it lacks the pronounced amplitude modulation which is so strikingly expressed in the eastern calls. This qualitative difference is of such magnitude that, on the basis of comparisons of calls of closely related sympatric species of anurans (Littlejohn, 1965b), we might expect the calls to operate as effective premating isolating mechanisms should the two populations ever become sympatric. This finding gives further support to the conclusion made by Dr Lee, on the basis of their morphological differentiation, that the disjuncts have achieved species status.

#### Acknowledgements

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## Explanation of Plate

## PLATE 8

- FIG. 1—Adult male specimen of *Heleioporus australiacus* from 29 miles N. of Cann River, Vic.  
FIG. 2—A, an audiospectrogram, and B, an oscillogram of a call of *Heleioporus australiacus*, recorded 29 miles N of Cann River, Vic. The time marker in the lower trace indicates 0.01 second intervals.